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(54) Abstract Title: Reducing intermodulation interference in a receiver

(57) A wireless communication unit 100 includes a radio receiver having a processor 108 configured to determine at least one characteristic of a received signal. An electronic switchable pad arrangement 206 is configured such that a lossy pad is switched automatically into a receiver path by the processor to provide improved intermodulation performance in accordance with the characteristic of the signal. The lossy pad may be switched out of the receiver path to improve the sensitivity of the receiver. The characteristic of the received signal may include signal strength, which may be determined from the location of the unit.

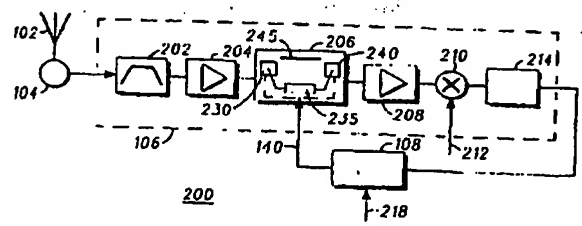

FIG. 2

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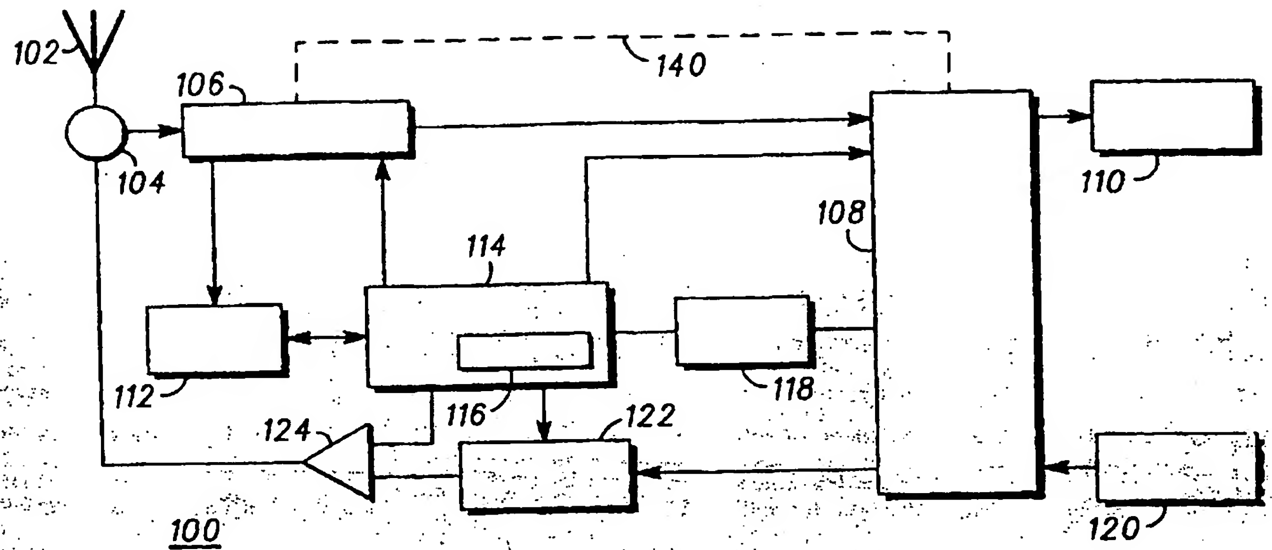
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995


102
104
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140
108
110
114
112
116
118
124
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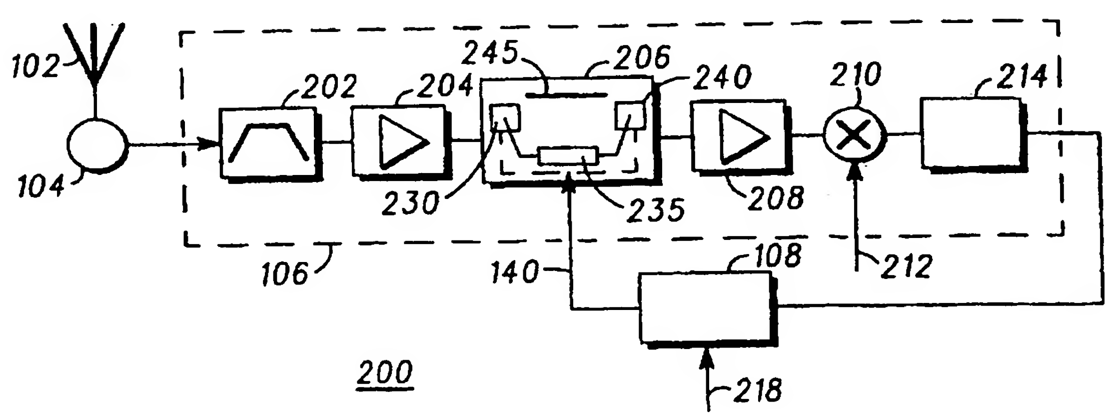
120
100

FIG. 1


102
104
202
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206
240
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214
230
235
208
106
140
108
212
218
200

FIG. 2

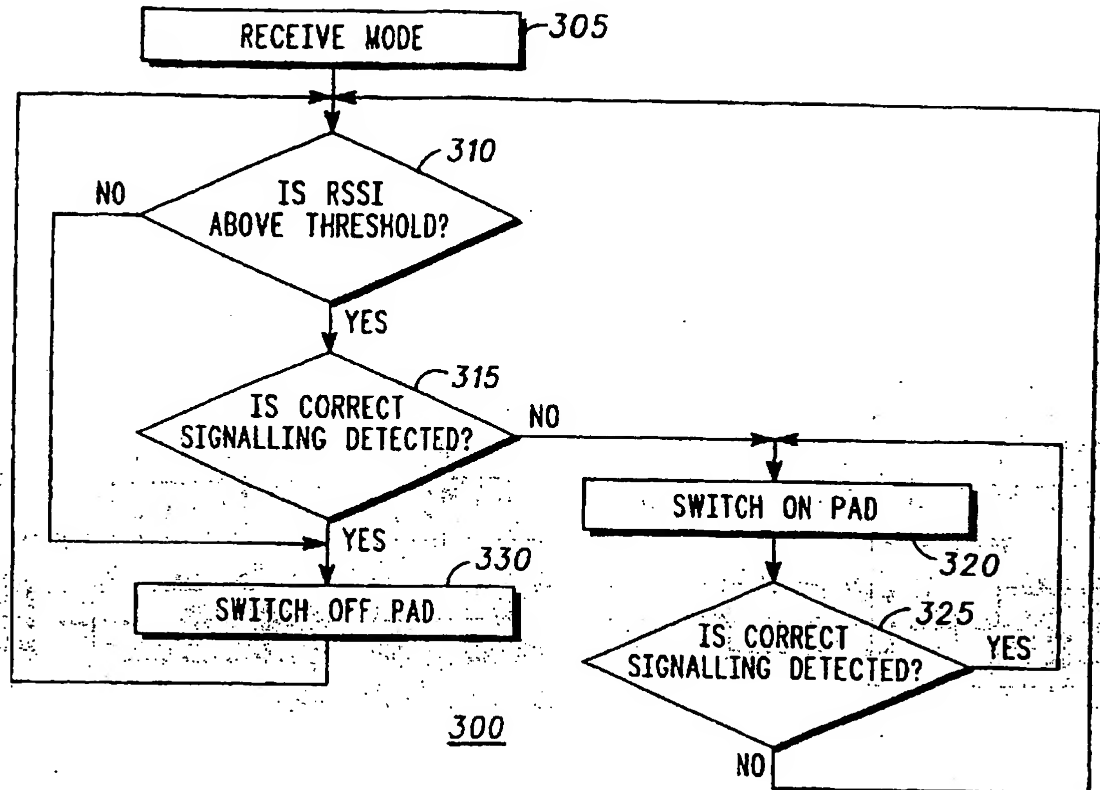
RECEIVE MODE
305
310
IS RSSI ABOVE THRESHOLD?
NO
YES
315
IS CORRECT SIGNALLING DETECTED?
NO
YES
330
SWITCH OFF PAD
SWITCH ON PAD
320
325
IS CORRECT SIGNALLING DETECTED?
YES
NO
300

FIG. 3

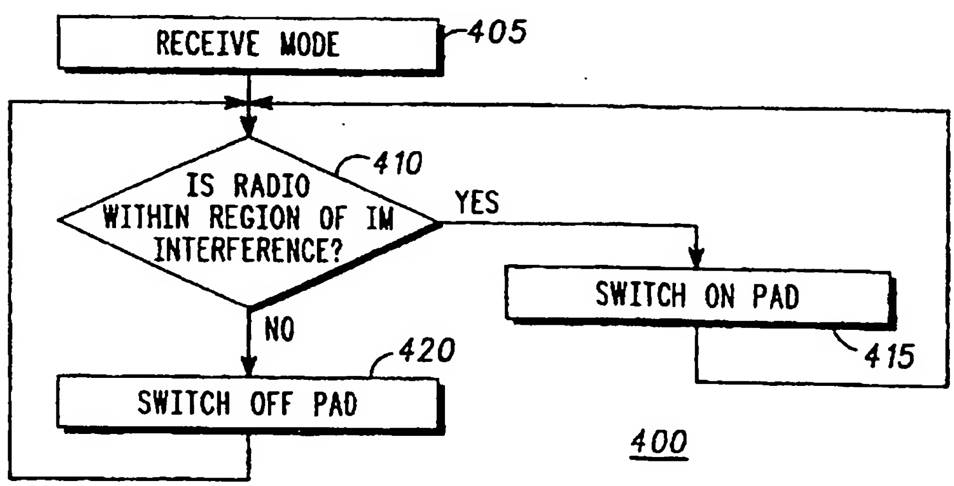
RECEIVE MODE
405
410
IS RADIO WITHIN REGION OF IM INTERFERENCE?
YES
NO
SWITCH ON PAD
415
420
SWITCH OFF PAD
400

FIG. 4

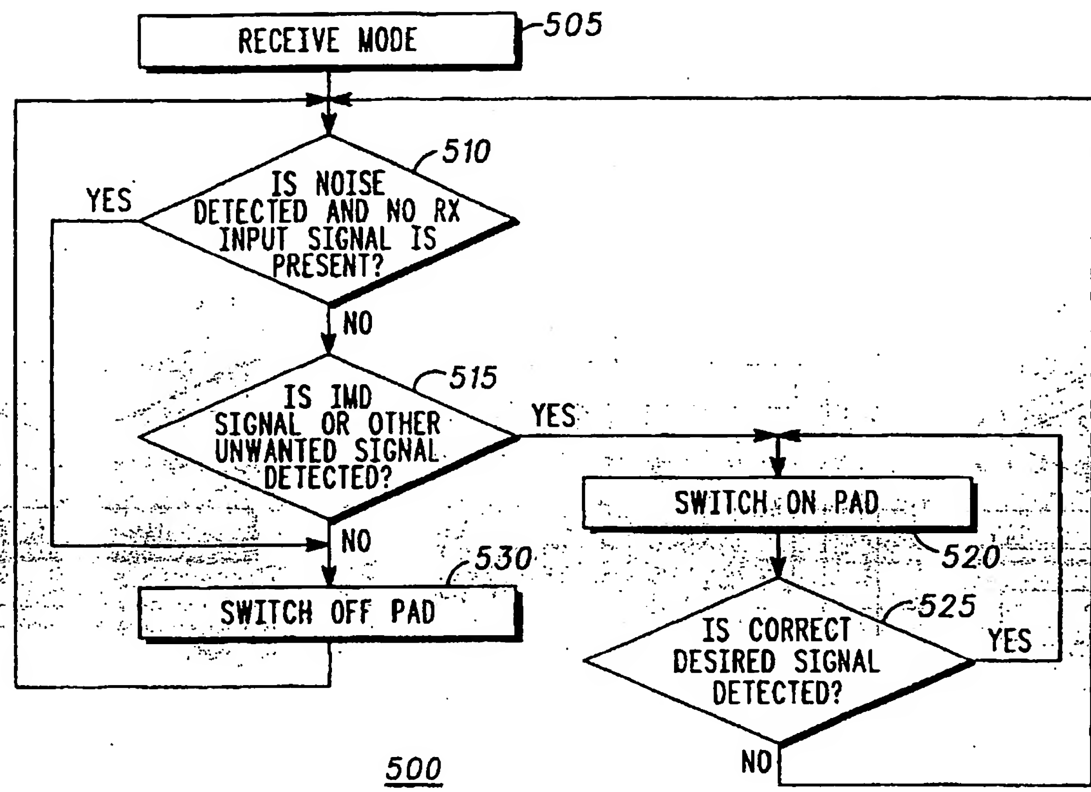
RECEIVE MODE
505
510
IS NOISE DETECTED AND NO RX INPUT SIGNAL IS PRESENT?
YES
NO
515
IS IMD SIGNAL OR OTHER UNWANTED SIGNAL DETECTED?
YES
NO
SWITCH ON PAD
520
525
IS CORRECT DESIRED SIGNAL DETECTED?
YES
NO
530
SWITCH OFF PAD
500

FIG. 5

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Wireless Communication Unit And Method For Improving A Radio Receiver's Intermodulation Interference

Field of the Invention

This invention relates to portable radio and/or cellular phone receiver technology. The invention is applicable to, but not limited to, improving the intermodulation interference performance of such receiver technology.

Background of the Invention

Wireless communication units (often termed subscriber units) are increasingly becoming essential communication tools for people in day-to-day personal and business communications. As new network infrastructures are implemented and competition between wireless carriers increases, digital wireless subscribers are becoming ever more critical of the service and voice quality they receive from network providers.

In the field of wireless communication, it is known that a key technology in attempting to provide near-wireline voice quality across a wireless carrier's network is a radio's/phone's receiver performance. In particular, the ability of a receiver to reject unwanted signals is paramount. Such a rejection performance is a function of a receiver's selectivity and linearity, primarily determined by its radio frequency circuits and devices.

In the field of this invention, it is known that the intermodulation (IM) performance of a radio's receiver path may be inadequate in the presence of a strong (high-level) interferer. IM interference results from high-level signals, from neighbouring transmitters, passing through the antenna and radio frequency circuits of a radio receiver. In the radio receiver, these signals generate intermodulation products that cause interference with the wanted signal.

Intermodulation is the 'multiplication' of one frequency by other frequencies. This occurs due to non-linearities in the input stages of receivers, prior to any intermediate frequency (IF) filtering. Basically, a trigonemetrical identity shows that when one sine or cosine function is multiplied by another then the resulting function contains new frequencies consisting of the sum and difference of the frequencies of the two original functions.

A well-known IM effect is the 'close third order' type of intermodulation distortion (IMD), measurement of which can indicate a better immunity of a receiver to echo contamination. When the close-third IMD result is used in 'normalized' form, that is, when the distortion product level is given as being 'so-many dB below' a stimulus level, the common effect of the echo contamination on the tones cancels out. A 'close third order' distortion occurs at twice the frequency of one stimulus minus one times the frequency of the other stimulus at either:

$$(2*f1-f2) \qquad [1]$$

Or

$$(2*f2-f1) \qquad [2]$$

Therefore, if the two stimulus frequencies are 'x' Hz away from each other, the close third order products will appear at 'x' Hz outside of the pair of stimulus frequencies.

The IM problem is particularly acute because the frequencies of the IM products created in cellular and private mobile subscriber transmitting antennas very often interfere with the desired signal in the base station receivers and cannot be filtered out. These receivers, designed to be sensitive to low-level signals, are therefore highly susceptible to IM interference. The effects of such IM interference, well known to wireless operators, include: poor call quality, dropped calls, customer dissatisfaction and costly antenna replacement.

In known receiver designs, an improvement in a receiver's IM performance can be achieved by inserting a lossy pad in the receiver chain. However, the use of a lossy pad has the disadvantage that the receiver's sensitivity performance is permanently made poor, and the receiver's IM performance is rarely, if ever, optimal.

A need therefore exists for an improved receiver design wherein the abovementioned disadvantages may be alleviated.

Statement of Invention

In accordance with a first aspect of the present invention, there is provided a wireless communication unit incorporating a receiver, as claimed in Claim 1. In accordance with a

second aspect of the present invention, there is provided a method for improving an intermodulation performance of a wireless communication unit, as claimed in Claim 8. In accordance with a third aspect of the present invention, there is provided a storage medium storing processor-implementable instructions for controlling a processor, as claimed in Claim 11. Further aspects of the invention are as claimed in the dependent claims.

In summary, the preferred embodiment of the present invention proposes a wireless communication unit and method for improving an intermodulation performance of a wireless communication unit wherein a processor determines at least one characteristic of a received signal. An electronic switchable pad arrangement, operably coupled to the processor, is configured such that a lossy pad is switched automatically into the receiver path by the processor to provide an improved intermodulation performance of the receiver in response to the determined at least one characteristic, or the lossy pad is switched automatically out of the receiver path by the processor to provide receiver sensitivity in response to the determined at least one characteristic.

In this manner, a receiver is able to adapt automatically its IM performance by inserting one or more switchable lossy pad(s) into a receiver path, in response to a determined signal characteristic, thereby providing improved IM rejection of undesired received signals, in appropriate signal reception conditions.

Brief Description of the Drawings

Exemplary embodiments of the present invention will now be described, with reference to the accompanying drawings, in which:

FIG. 1 shows a block diagram of a radio communication unit adapted to support the various inventive concepts of the preferred embodiment of the present invention, with regard to adaptive control of a receiver's intermodulation performance;

FIG. 2 shows a block diagram of a radio communication unit's receiver chain adapted to support the various inventive concepts of the preferred embodiment of the present invention;

FIG. 3 shows a flowchart of a receiver operation to adaptively control a receiver's IM performance in accordance with the preferred embodiment of the present invention;

FIG. 4 shows a flowchart of a receiver operation to adaptively control a receiver's IM performance in accordance with an alternative embodiment of the present invention; and

FIG. 5 shows a flowchart of a receiver operation to adaptively control a receiver's IM performance in accordance with a yet further alternative embodiment of the present invention.

Description of Preferred Embodiments

Referring now to FIG. 1, a block diagram of a wireless communication unit, for example a subscriber unit/mobile station (MS) 100, adapted to support the inventive concepts of the preferred embodiments of the present invention, is shown.

The MS 100 contains an antenna 102 preferably coupled to a duplex filter, antenna switch or circulator 104 that provides isolation between receive and transmit chains within MS 100.

The receiver chain includes scanning receiver front-end circuitry 106 (effectively providing reception, filtering and intermediate or base-band frequency conversion), as described in greater detail with respect to FIG. 2. The scanning front-end circuit 106 is serially coupled to a signal processing function (processor, generally realised by a digital signal processor (DSP)) 108.

In accordance with a preferred embodiment of the invention, the scanning front-end circuit 106 and, in particular, the signal processing function 108, have been adapted for a receiving MS to receive and process one or more 'on-channel' signals in the presence of strong interfering signals. This is achieved by adapting the IM performance of the receiver, by inserting an electronic switchable pad arrangement into the receiver path, and selecting a path according to the signal conditions prevalent at that time. In this manner, the MS 100 is able to re-configure its receiver operation for

improved IM performance or optimal receiver sensitivity dependent upon the prevailing signal conditions.

A controller 114 is operably coupled to the scanning front-end circuitry 106 so that the receiver can calculate receive bit-error-rate (BER) or frame-error-rate (FER) or similar link-quality measurement data from recovered information via a received signal strength indication (RSSI) function 112. The RSSI function 112 is operably coupled to the scanning front-end circuit 106 to provide an indication of the desired signal's received signal level. The memory device 116 stores a wide array of MS-specific data, for example decoding/encoding functions. In accordance with the preferred embodiment of the present invention, the memory device 116 has been adapted to also store programs and/or data of IM performance information based on 'on-channel' and 'off-channel' signal measurements obtained from, say, the RSSI function 112. The memory device 116 may also store propagation /interference data, perhaps in a topology map format, as described later.

A timer 118 is operably coupled to the controller 114 to control the timing of operations, namely the transmission or reception of time-dependent signals, within the MS 100. As known in the art, received signals that are processed by the signal processing function are ultimately input to an output device 110, such as a speaker or visual display unit (VDU).

As regards the transmit chain, this essentially includes an input device 120, such as a microphone, coupled in series through a processor 108, transmitter/modulation circuitry 122

and a power amplifier 124. The processor 108, transmitter/modulation circuitry 122 and the power amplifier 124 are operationally responsive to the controller, with an output from the power amplifier coupled to the duplex filter or circulator 204, as known in the art.

The signal processor function 108 in the transmit chain may be implemented as distinct from the processor in the receive chain. Alternatively, a single processor may be used to implement processing of both transmit and receive signals, as shown in FIG. 1.

Of course, the various components within the MS 100 can be realised in discrete or integrated component form, with an ultimate structure therefore being merely an arbitrary selection.

Referring now to FIG. 2, a block diagram 200 of a radio communication unit's receiver chain, adapted to support the various inventive concepts of the preferred embodiment of the present invention, is shown. In particular, the scanning front-end circuitry 106 of the MS 100 of FIG. 1 is described in greater detail.

The scanning front-end circuitry 106 includes a radio frequency (RF) bandpass filter (BPF) 202. The BPF 202 removes undesired received frequencies outside of the receiver's operating bandwidth, whilst allowing the desired frequencies within the operating bandwidth of the receiver to pass there through. The BPF is coupled to a low noise pre-amplifier (LNA) 204, which provides a limited amplification

of received signals, whilst predominantly setting the noise figure performance for the receiver.

In accordance with the preferred embodiment of the present invention, the LNA 204 is operably coupled to an electronic switchable pad arrangement 206. The electronic switchable pad arrangement 206 includes, for example, an input single-pole double-throw (SPDT) switch 230 and output SPDT switch 240. Between the input switch 230 and output switch 240, a lossy pad 235 and a transmission path 245 have been positioned. The operation of the switches 230, 240 are controlled by processor 108, via steering control line 140, to select either of the paths - the lossy pad 235 or the transmission path 245. The processor 108 controls which path is selected based on the determined characteristic. The lossy pad 235 is optimised for high IM performance and small sensitivity loss when activated in the receiver path. The use of the electronic switchable pad arrangement 206 improves IM rejection by reducing the possibility of large signal overload.

The electronic switchable pad arrangement 206 is configured such that when the lossy pad 235 is deactivated, and thereby the transmission path 245 is selected, the receiver's IM rejection is much lower than in the activated mode. In this mode, the receiver sensitivity is a few (3-4) dB better. It is noteworthy that such a small receiver sensitivity change is relatively unimportant if otherwise high RF input signals are blocking the desired signal.

The electronic switchable pad arrangement 206 is controlled by microprocessor 108 via steering line 140. The remaining part of the receiver chain follows a typical heterodyne receiver architecture. The output from the electronic switchable pad arrangement 206 is input to a second BPF 208 to filter out harmonics of the desired signal due to signal amplification in the LNA 204. The filtered signal is then input to a mixer 210, where the desired signal is mixed with a local oscillator (LO) signal to produce an intermediate frequency (IF) component of the desired signal. The desired IF signal is then filtered and processed in a receiver back-end circuit where the signal is demodulated and a baseband speech or data signal recovered. The baseband speech or data signal is input to, for example, the microprocessor 108 in order to format the signal for enunciation by a microphone or display on an output device.

In accordance with the preferred embodiment of the present invention, the microprocessor 108 has been adapted to control the switching operation of the electronic switchable pad arrangement 206 to include or exclude the lossy pad 235 from being in the receiver path.

A skilled artisan would recognise that many alternative configurations of the electronic switchable pad arrangement can be used to select or de-select a lossy pad within the receiver chain. As a consequence, the electronic switchable pad arrangement shown in FIG. 2 is a preferred example of such configurations.

In accordance with the preferred embodiment of the present invention, in order for the microprocessor 108 to decide whether to switch the lossy pad 235 into (or out of) the receiver path, the microprocessor 108 is preferably provided with one or more of the following characteristics that can be used to indicate the prevailing signal conditions of the MS 100:

(i) Mobility information, for example supplied from a wheel sensor, that describes the direction, speed and/or wavelength of a mobile or mobile transmitted signal in order to provide an indication of the mobile's location;

(ii) Location information obtained using, for example Global positioning system (GPS) information, or Navigation system information;

(iii) RSSI information from RSSI function 112;

(iv) Decoder based decision of valid or invalid signal and/or code information; and/or

(v) Modulation analysis information.

It is envisaged that one or any combination of the above characteristics may be used to indicate to the microprocessor 108 the state of signal conditions prevalent at any particular time.

It is also envisaged that a number of mechanisms can also be used to generate the above information, in order to influence the microprocessor's decision. A first mechanism could be to determine the geographical location of the strong signal interferer, for example based on channel frequency information, field strength and terrestrial topology. From this, the field strength information of any strong signal

transmitters may be used to generate a propagation map for the geographic area of interest. The same propagation data may then be applied to any desired signal paths to determine whether an improved IM receiver performance may be required. It is envisaged that such propagation/interference information may be stored in the radio.

A second mechanism could be for a MS to develop a propagation map from data recorded from receiving a number of MS transmissions, such that the propagation map, once generated, is continuously updated over time. An example of this is illustrated in the flowchart 300 of FIG. 3. When a MS is in a receive mode of operation in step 305, an RSSI measurement is made on a received signal, in step 310. If the RSSI measurement is above a particular threshold, in step 310, a determination is made as to whether the received signal is a desired signal or not. If the received signal is a desired signal, i.e. the signal can be correctly decoded, the lossy pad is by-passed/switched out of the receiver path in step 330, as the desired signal is strong enough to be adequately received. If the RSSI measurement of the received signal is not sufficient to be above the threshold in step 310, it is assumed that an improved IM performance of the receiver path would still fail to help the receiver receive and decode the signal in step 330.

However, if the RSSI measurement is above the threshold in step 310, and yet the received signal cannot be correctly decoded in step 315, it is assumed that a mode of operation that improves the IM performance of the MS may help. In this regard, the lossy pad is switched into the receiver path in

step 320. If the received signal can then be correctly decoded in step 325, the lossy pad providing an improved I performance is maintained in the receiver path. If the received signal can still not be correctly decoded in step 325, further RSSI measurements and received signal decodin are performed, until the desired signal can be adequately received.

Alternatively, or in addition, RSSI measurements may be us to generate an interference propagation map. In this mann when a useful RSSI signal level is received, but no valid signal can be detected, the microprocessor 108 may decide switch the lossy pad 235 into the MS 100 receiver path.

Interference propagation data can also assist a MS in determining how to use the electronic switchable pad arrangement 206, as illustrated in the alternative embodim of flowchart 400 of FIG. 4. Again, it is assumed that the process is only initiated when the MS 100 is in a receive mode of operation, in step 405. Using the interference propagation data, generated or measured as described above, the MS 100 is able to automatically switch the lossy pad 23 into its receiver path in step 415. Such switching is effected by the microprocessor 108 if the MS enters a known area of interference, in step 410. Otherwise, or if the MS leaves the area of interference, the lossy pad 235 will be switched automatically out of the receiver path in step 420 in order to optimise receiver sensitivity in the MS 100 in contrast to IM improvement.

It is envisaged that the lossy pad may be implemented using a length of microstrip or stripline, whose main characteristic is loss, for example between 3dB and 10dB.

It will be appreciated that the electronic switchable pad arrangement 206, as illustrated in FIG. 2 may alternatively be implemented in any suitable manner to facilitate and perform the inventive concepts described herein. Notably, it is envisaged that the user via a user interface may initiate the operation of the microprocessor 108, vis-à-vis control of the electronically switchable pad. Alternatively, the operation of the microprocessor 108, vis-à-vis control of the electronically switchable pad, may be programmed remotely, say by a network operator.

As mentioned, the preferred embodiment of the present invention is to place the electronic switchable pad arrangement after the receiver LNA. Advantageously, such positioning reduces the signal level at the mixer input, which is usually the limiting stage with regard to IM performance. Positioning the electronic switchable pad arrangement after the receiver LNA also maintains a good receiver noise figure performance. However, a skilled artisan would recognise that alternative configurations may still provide some benefit. As such, the inventive concepts should not be viewed as being limited to the above-described preferred embodiment.

Advantageously, the present invention aims to improve a receiver's IM performance by using a simple automatically selectable lossy pad within an electronic switchable pad

arrangement. This is in contrast to existing receiver architectures that use specific components, having a high intercept point characteristic, to improve IM rejection, as known to those skilled in the art.

It is within the contemplation of the invention that the microprocessor 108 and/or memory device 116 of the MS 100 (or any other wireless communication unit) may be (re-)programmed with an algorithm supporting the inventive concepts of the present invention. This is described below. More generally, according to the preferred embodiment of the present invention, such (re-)programming to adapt the use of an electronic switchable pad arrangement may be implemented in a respective MS 100 (or any other radio frequency communication device) in any suitable manner. For example, a new memory chip or processor may be added to a conventional MS 100.

Alternatively, existing parts of a conventional MS 100 (or any other radio frequency communication device) may be adapted, for example by reprogramming one or more processors therein. As such, the required adaptation may be implemented in the form of processor-implementable instructions stored on a storage medium, such as a floppy disk, hard disk, programmable ROM (PROM), RAM or any combination of these or other storage media.

In particular, it is envisaged that a MS may include a special decoder, implemented in hardware (HW), software (SW) or in a digital signal processor (DSP) to analyse received data or voice. By decoding the received data or voice the MS

may determine if the decoded signal is a wanted signal or an unwanted signal. One example would be to extract, say, a user identifier (ID) from the decoded signal, used in many wireless communication standards, such as: global system for mobile communications (GSM) transmission, digital interchange of information and signalling (DIIS) or Terrestrial Trunked Radio (Tetra). If the MS determines that the user ID is not correct, the lossy pad may be activated (inserted into the receiver path) to improve the MS's IM performance, to attempt to accurately receive and decode the user ID.

In the context of using a decoded signal to determine whether or not to automatically switch in the lossy pad, the microprocessor 108 may measure the deviation of the received signal. If the received signal is being subjected to IM interference, the deviation will be different in amplitude to a typical desired signal.

An additional method may be for the microprocessor 108 to analyse the modulation type or scheme, as illustrated in the flowchart 500 of FIG. 5. This embodiment utilises the fact that it is possible to clearly distinguish between a desired received signal with valid modulation, and a received signal having scrambled modulation resulting from IM mixing products. Again, it is assumed that the process is only initiated when the MS is in a receive mode of operation, in step 505. If noise is detected, without a desired received signal being present, the lossy pad is automatically by-passed and the transmission path used, in step 530, to improve receiver sensitivity.

If a desired received signal is present and/or an IM distorted or other unwanted signal is not detected in step 515, the lossy pad is again automatically by-passed and the transmission path used in the receive path in step 530. However, if an IM distorted or other unwanted signal is detected in step 515, the lossy pad is automatically switched into the receiver path in step 520.

In a similar manner to the process of FIG. 3, the received signal is demodulated to determine whether the correct signal can be detected/decoded, in step 525. If the signal can be adequately demodulated, the lossy pad remains in the receiver path to improve the IM performance of the received signal. If the correct signal can still not be correctly detected/decoded in step 525, the process returns to step 510 and a determination is made as to whether noise is detected.

It will be understood that the aforementioned receiver, having an adaptive IM performance improvement mode of operation, provides at least the following advantage. A receiver is able to adapt automatically its IM performance, by inserting one or more switchable lossy pads into a receiver path, thereby providing improved IM rejection of undesired received signals. In this manner, a receiver can provide improved data and voice quality, even under difficult receiving conditions.

Method of the invention

Summarising the discussion above, a method for improving an intermodulation performance of a wireless communication unit has been described. The method includes the step of

determining at least one characteristic of a received signal received by the wireless communication unit. A lossy pad within an electronic switchable pad arrangement is switched automatically into a receiver path of the wireless communication unit to provide an improved intermodulation performance of the receiver in response to the determined at least one characteristic. Alternatively, the lossy pad is switched automatically out of the receiver path of the wireless communication unit to improve receiver sensitivity in response to the determined at least one characteristic.

Apparatus of the invention

The primary focus for the present invention is a private mobile subscriber radio unit, such as one supporting the TETRA standard. However, the inventor of the present invention has recognised that the present invention may also be applied to any other wireless communication unit. Thus mobile phones, other mobile or portable radios, wirelessly enabled PDAs and lap-top computers, 3G and 4G communication devices may all benefit from the present invention.

Summarising the discussion above, a wireless communication unit has been described that includes a radio receiver having a processor configured to determine at least one characteristic of a received signal. An electronic switchable pad arrangement, operably coupled to the processor, is configured such that a lossy pad is switched automatically into a receiver path by the processor to provide an improved intermodulation performance of the receiver in response to the determined at least one

characteristic. Alternatively, the lossy pad is switched automatically out of the receiver path by the processor to improve receiver sensitivity in response to the determined at least one characteristic.

Whilst specific, and preferred, implementations of the present invention are described above, it is clear that one skilled in the art could readily apply variations and modifications of such inventive concepts.

Thus, a wireless communication unit and method for improving an intermodulation performance of a wireless communication unit have been described wherein at least some of the aforementioned disadvantages associated with prior art wireless communication units and methods for improving intermodulation performance have been substantially alleviated.

Claims

1. A wireless communication unit (100) comprising a radio receiver (200) having:

a processor (108) configured to determine at least one characteristic of a received signal;

the radio receiver (200) characterised by:

an electronic switchable pad arrangement (206), operably coupled to said processor (108), and configured such that a lossy pad (235) within the arrangement is:

switched automatically into a receiver path by said processor (108) to provide an improved intermodulation performance of said receiver in response to said determined at least one characteristic, or

switched automatically out of said receiver path by said processor (108) to improve receiver sensitivity in response to said determined at least one characteristic.

2. The wireless communication unit (100) according to Claim 1, further characterised by:

an amplifier (204), operably coupled to said electronic switchable pad arrangement (206), such that said electronic switchable pad arrangement (206) is positioned in said receiver path after said amplifier to minimise an affect on a receiver noise figure when switching automatically said lossy pad (235) into said receiver path.

3. The wireless communication unit (100) according to Claim 1 or Claim 2, further characterised by said microprocessor (108) determining said at least one characteristic from one or more of the following data:
(i) Mobility information describes a direction, speed and/or wavelength of a said wireless communication unit;
(ii) A geographic location of said wireless communication unit (100) or an interference signal, for example obtained using global positioning system (GPS) information or Navigation system information;
(iii) Received signal strength information of a received signal; or
(iv) Information decoded from a received signal indicating whether said received signal is a valid or invalid signal.

4. The wireless communication unit (100) according to Claim 3, wherein a determination of the geographical location of said wireless communication unit (100) or said interference signal is based on one or more of: channel frequency information, signal strength information, terrestrial topology information.

5. The wireless communication unit (100) according to Claim 3 or Claim 4, wherein said processor (108) generates and updates interference or propagation data using one or more of said data over time in order to determine the at least one signal characteristic.

6. The wireless communication unit (100) according to Claim 3, Claim 4 or Claim 5, wherein said microprocessor (108) uses interference or propagation data to determine when said wireless communication unit enters (410) an area of interference, and in response to said determination switches automatically said lossy pad (235) into or out of said receiver path.

7. The wireless communication unit (100) according to any preceding Claim, wherein said lossy pad is switched automatically into the receiver path by said microprocessor in one of the following ways:
(i) In response to an instruction from a user of the wireless communication unit via a user interface,
(ii) Programmed remotely, say by a network operator.

8. A method (300, 400, 500) for improving an intermodulation performance of a wireless communication unit (100), the method comprising the step of:

determining at least one characteristic of a received signal received by said wireless communication unit (100); the method characterised by the step of:

switching automatically a lossy pad into a receiver path of said wireless communication unit (100) to provide an improved intermodulation performance of said receiver in response to said determined at least one characteristic, or

switching automatically said lossy pad out of said receiver path of said wireless communication unit (100) to improve receiver sensitivity in response to said determined at least one characteristic.

9. The method (300, 400, 500) for improving an intermodulation performance of a wireless communication unit (100) according to Claim 8, the method further characterised by the step of determining said at least one characteristic from one or more of the following data:

(i) Mobility information that describes a direction, speed and/or wavelength of a wireless communication unit (100);

(ii) A geographic location of said wireless communication unit (100) or an interference signal, for example obtained using global positioning system (GPS) information or Navigation system information;

(iii) Received signal strength information of a received signal; or

(iv) Information decoded from a received signal indicating whether said received signal is a valid or invalid signal.

10. The method (300, 400, 500) for improving an intermodulation performance of a wireless communication unit (100) according to Claim 9, the method further characterised by the steps of:

generating interference or propagation map from at least one of said data; and

updating said interference or propagation map over time in order to determine accurately the at least one signal characteristic.

11. A storage medium storing processor-implementable instructions for controlling one or more processors to carry out the method of any of Claims 8 to 10.

12. A wireless communication unit (100) with improved intermodulation performance substantially as hereinbefore described with reference to, and/or as illustrated by, FIG. 1 or FIG. 2 of the accompanying drawings.

13. A method (300, 400, 500) for improving an intermodulation performance of a wireless communication unit (100) substantially as hereinbefore described with reference to, and/or as illustrated by, FIG. 3 or FIG. 4 or FIG. 5 of the accompanying drawings.

Application No:	GB 0211969.1	**Examiner:**	Glyn Hughes
Claims searched:	1 to 13	**Date of search:**	21 October 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): H4L (LEQF, LERX, LFNB)

Int Cl (Ed.7): H04B 1/10, 1/16, 1/18

Other: Online: WPI, JAPIO, EPODOC, INSPEC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	JP 56157133 A (PIONEER) see PAJ abstract	1,3,8,9,11

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
		E	Patent document published on or after, but with priority date earlier than, the filing date of this application.
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